

AMENDMENTS TO THE CLAIMS

1 (Currently Amended). A method of using a codebook of frame patterns identified by index numbers to code a voice signal by sampling the voice signal to obtain sample values, grouping the sample values into frames, predicting the sample values in each frame, taking differences between the sample values and the predicted sample values in each frame to obtain a differential frame, searching the codebook to find a frame pattern most closely matching the differential frame, and writing the index number of the most closely matching frame pattern in a memory device as a coded value of the frame, each frame including a predetermined number of consecutive sample values from a first sample value to a last sample value, each sample value except the last sample value having a next sample value in the frame, wherein predicting the sample values in each frame comprises the steps of:

(a) predicting the first sample value in the frame from at least one sample value of an immediately preceding frame; and

(b) using each predicted sample value in the frame, except the last sample value in the frame, in predicting the next sample value in the frame;

wherein said step (a) predicts that the first sample value in the frame is equal to the last sample value of the immediately preceding frame, and said step (b) predicts that all sample values in the frame after the first sample value in the frame are equal to the first sample value in the frame.

2 (Original). The method of claim 1, wherein predicting the sample values in each frame further comprises the steps of:

- (c) loading a certain number of final sample values of the immediately preceding frame into a shift register; and
- (d) shifting each predicted sample value into the shift register.

3 (Original). The method of claim 2, wherein said steps (a) and (b) include performing a multiply-add operation on the sample values stored in the shift register.

4 (Original). The method of claim 2, wherein said certain number of final sample values constitute a last half of the sample values of the immediately preceding frame.

5 (Cancelled).

6 (Original). The method of claim 1, further comprising the step of:

- (e) decoding each frame with reference to the codebook;

wherein said sample values of the immediately preceding frame are decoded sample values.

7 (Currently Amended). A voice recording and reproducing device of the type that samples a voice signal, divides the sampled voice signal into frames, predicts sample values of each frame, takes differences between the predicted sample values and actual sample values of the frame, codes the differences by vector quantization with reference to a codebook, stores resulting coded data in a memory device, and decodes the coded data with reference to the codebook, having a prediction unit comprising:

a first shift register for storing sample values; and

an arithmetic unit coupled to the first shift register, performing an add-multiply operation on the sample values stored in the first shift register to obtain a predicted sample value, and feeding the predicted sample value back into the first shift register for use in predicting a next sample value;

wherein the voice recording and reproducing device predicts each said frame by ~~loading a predetermined number of sample values of an immediately preceding frame into the first shift register, then repeatedly activating the arithmetic unit and shifting the sample values stored in the first shift register~~ predicting a first sample value, wherein the first sample value in the frame is equal to a last sample value of an immediately preceding frame, and using each predicted sample value in the frame in predicting the next sample value in the frame, wherein all sample values in the frame after the first sample value in the frame are equal to the first sample value in the frame.

8 (Original). The voice recording and reproducing device of claim 7, wherein the prediction unit further comprises a second shift register receiving and shifting each predicted sample value output from the arithmetic unit, storing a number of predicted sample values equivalent to a length of one frame for output as a predicted frame.

PS 9 (Original). The voice recording and reproducing device of claim 7, wherein the sample values of the immediately preceding frame loaded into the first shift register constitute a last half of the sampled values of the immediately preceding frame.

10 (Original). The voice recording and reproducing device of claim 7, wherein said sample values of the immediately preceding frame are decoded sample values.

11 (Amended). A voice recording and reproducing device of the type that samples a voice signal, divides the sampled voice signal into frames, predicts sample values of each frame, take differences between the predicted sample values and actual sample values of the frame, codes the differences by vector quantization with reference to a codebook, stores resulting coded data in a memory device, and decodes the coded data with reference to the codebook, wherein ~~the predicted sample values of each frame are all equal to a last sample of an immediately preceding frame~~ predicting a first sample value, the first sample value in the frame equal to a last sample value of an immediately preceding frame, and using each predicted sample value in the frame in predicting the next sample value in the frame, wherein all sample values in the frame after the first sample value in the frame are equal to the first sample value in the frame.

12 (Original). The voice recording and reproducing device of claim 11, having a prediction unit comprising:

an input register storing said last sample value of the immediately preceding frame;

a plurality of output registers storing said predicted sample values; and

signal lines for copying said last sample value from the input register to each one of the output registers,

13 (Original). The voice recording and reproducing device of claim 11, wherein said last sample value of the immediately preceding frame is a decoded sample value.

14 (New). A method of using a codebook of frame patterns identified by index numbers to code a voice signal by sampling the voice signal to obtain sample values, grouping the sample values into frames, predicting the sample values in each frame, taking differences between the sample values and the predicted sample values in each frame to obtain a differential frame, searching the codebook to find a frame pattern most closely matching the differential frame, and writing the index number of the most closely matching frame pattern in a memory device as a coded value of the frame, each frame including a predetermined number of consecutive sample values from a first sample value to a last sample value, each sample value except the last sample value having a next sample value in the frame, wherein predicting the sample values in each frame comprises the steps of:

- (a) loading at least one sample value of an immediately preceding frame into an input shift register;
- (b) performing an arithmetic operation on contents of the input shift register to predict a sample value in the frame;
- (c) shifting the predicted sample value into an output shift register;
- (d) shifting the predicted sample value into an output shift register;
- (e) repeating steps (b), (c), and (d) to predict subsequent sample values in the frame until all sample values in the frame have been predicted;
- (f) reading the predicted sample values from the output shift register;
- (g) taking differences between the sample values in the frame and the predicted sample values read from the output shift register; and

(h) supplying the differences to a vector quantizer.

P